

Environmental Science 15 – Intro to Energy

Mid Term II Study Guide

You have permission to use a single side of a letter sized piece of paper for note for during the exam. I will provide any constants or data required for your calculation (e.g. energy per kg of oil, natural gas, etc.). I will not provide any equations, you will need to be able to use them on your own. Be prepared to use any formula that you found in the homework or activities. You may need to think a little during the exam.

Chapter 8: What is the source of heat in the Earth? What is a geothermal gradient? Where is the highest geothermal energy potential (what geologic features contribute to this)? What can geothermal energy be used for? What are some limitations of geothermal energy? How does a heat pump work? Can you explain the tides, what causes them, why are there two high tides (two tidal bulges)? What is the astronomical configuration for the highest and the lowest tides? How can tides be used to generate electricity? How can waves be used to generate electricity?

Chapter 9: Compare the proportion of the electromagnetic spectrum that incoming solar radiation spans and that black body radiation (earth, GHGs) spans. What is solar insolation? Where is insolation highest? What can lower insolation? How does insolation vary during the day? How much solar energy reaches the surface of the earth (in percent)? What are some reasons it does not all reach the surface? Explain how passive solar heating works and compare that with active solar heating. What is a trombe wall? How does a Stirling Engine work? Describe three ways to convert solar energy to electricity. What is a semiconductor? How does a photovoltaic panel work? What do Boron and Phosphorous do in a PV panel? What are some limitations of solar generated electricity? What is net metering? What is the best PV efficiency today? Why would we tilt solar panels and at what angle would we do this? Could you determine how many solar panels it would take to replace another source of electricity (eg. homework chapter 9)?

Chapter 13: What is meant by climate forcing? How does the Greenhouse Effect work? What is a Green House Gas? Which one is most abundant? Which GHG has the strongest forcing? What are positive and negative forcing? What are two examples of each? Which GHG concentrations increased following the industrial revolution? How long into the past, at least, has it been since these concentrations exceeded today's concentrations? How much carbon do people emit each

year, globally? What is meant by a carbon sink? What is meant by residence time? Is there a lag between increases in CO₂ concentration in the atmosphere and in the ocean? What happens in the sea water when CO₂ concentration goes up? What is the cause of annual variations in CO₂ concentrations? How does seawater temperature affect the CO₂ concentration in sea water? What are some impacts of anthropogenically forced global climate change? How did global climate models demonstrate the unequivocal linkage between expected temperatures of natural forcing versus natural and anthropogenic forcing? What are the two end members for projections of temperature and sea level based on (e.g. RCP 2.6 and RCP 8.5)? What are some implications for changes in precipitation and temperature projected for the next century?

Chapter 6: What is pollution? What are some air pollutants? What are some ways to remove air pollutants? What causes acid rain? Where does the source of acid rain come from? What is the health hazard of CO? Where do heavy metals come from and where can they be found in the environment? What are some impacts of fossil fuel pollution?

Chapter 10: How are potential and kinetic energy used to generate electricity with water? What are some limitations of Hydrologic Electric power plants? What is the source of energy that creates the potential energy for hydroelectric power? What is the source of energy for wind? What is the reason why there is some limitation to the maximum extractable power from wind energy? What does the power curve tell us about wind turbine limitations? What are some other limitations to wind energy? How would one calculate the power per unit area for a wind turbine? How does this calculation tell us about why wind turbines are so sensitive to changes in wind velocity? How can we extract energy from biomass? What are some forms of raw materials for biomass energy? What are some impacts of biomass energy?